

2. Water, Thickeners, Dyes and Chemicals

2.1 Water in the Textile and Carpet Industry

Quality of process water is very critical and important for a successful dye and print operation. Especially water hardness is of importance. Hard water will result in higher usage of chemicals, thickeners and in bad results of dyeing and printing. A water softener

is recommended and in any way needed for the water used by the steam generator.

In case of high concentration of other minerals, elements and impurities it is strongly recommended to use filters, chemicals and other methods to reduce or remove them.



General Recommendation for Process Water in the Textile Industry

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Appearance		Clear, colorless, free of floating particles
Total hardness	dH°	1 - 4 dH (<1.2 mmol/l = 22 mg/dl)
Iron	mg/l	<0.1
Manganese	mg/l	<0.1
Copper	mg/l	<0.1
Nitrite	mg/l	<0,01, should not be existent
pH value		6.5 - 8.0
Organic impurities		KMNO ₄ consumption should be less than 20 mg/l
Bicarbonate		Limits are not available. If there is too much bicarbonate in the water the pH would be varying towards the alkaline during the steaming process
Conversion		mg/dl x 0.0555 = mmol/l mmol/l x 18.02 = mg/l

2.2 Thickeners (Gum)

As regards quality in carpet printing, a key role is played by the flow behavior of the printing paste. This is influenced by the thickener used. There is an extensive range of products available for a wide variety of fibers, carpet qualities, dye classes and printing methods. Thickener is a must in the printing process. It keeps the dyestuff on top of the fiber to avoid 'frosting'. In addition it prevents the dye from migrating between the pile.

2.2.1. Thickener for screen printing:

Most thickeners for screen printing are made of Guar, Xanthan, seaweeds... (= natural thickener).

These type of thickeners are relatively inexpensive. The thickener is normally mixed to a so called 'stock thickener' - thickener with a very high viscosity which is then mixed in a certain portion (about 30-50%) with water, dye and other additives. The result is the

ready made print paste with a certain viscosity. The viscosity depends on the printing process and the quality of the carpet.

Manufacturers for natural thickeners:

CHT, Germany
Polygal, Switzerland
Raniechemie, Germany

2.2.2. Thickener for Chromojet process:

Chromojet works best with high performance synthetic thickening systems especially developed for the jet print process. Most of these thickeners are based on polyacrylate.

The following requirements have to be matched:

- easy to dose, disperse and mix (Supra-Mix)
- good definition and sharp outlines
- high color yield
- no frosting
- highly stable viscosity

- good thixotrope properties
- must not clog jets
- easy to wash out and off
- good ecological properties (low COD and BOD)

Typical recipe for synthetic stock thickener:

980 - 970 g	Soft water
15 - 25 g	Synthetically thickener
2 - 4 g	Citric acid
1 - 2 g	Emulsifier / (if needed)
1 - 3 g	Anti-foam
0,5 - 2 g	Fungicide (if needed)
1,000 g	Stock thickener



Popular synthetic thickeners (paste in drums or totes):

Tanaprint from Bayer-Tanatex;
Texipol from Scott Baader, UK;
Prisulon-CSD from CHT, Germany;
Alcoprint from Ciba, Switzerland;
Chemaprint from Chematron, USA

2.3 Chemicals for Dyeing and Printing

Besides thickener and dyestuff there are a number of other additives used during the printing process:

- Antifoams - to avoid foaming during the preparation and application of print paste
- Penetration and leveling agents
- Resist chemicals - for resist printing
- Preservation Chemicals - to avoid bacteria and fungus
- Acid donors - to achieve a lower pH during steam process
- Retarding chemicals - to avoid that the dye is fixed before going into the steamer (cold strike).
- Dispersing and leveling agents (affinity to fiber, affinity to dyestuff)
- Wetting agents - to improve penetration of prints
- Anti-frosting agents - to avoid frosting especially on velour type carpet
- Carriers - for disperse dyeing of Polyester carpets
- Flame retardants or other finishing products
- Foaming agents - for foam finishes



Popular suppliers for printing and dyeing chemicals:

Bayer-Tanaprint
CHT, Germany
Zschimmer & Schwarz, Germany
Dr. Boehme, Germany
Allied Colloids, UK
Chematron, USA

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2.4 Dyestuff Selection

Fastness is always influenced by the type and construction and the treatment (heat setting) of the fiber, and the type

and family of dyestuff. Dyes should show similar diffusion and trichromatic behavior and fixation rates. The combi-

nation of fibers, dyes and auxiliaries must be selected carefully.

Nylon, Polyamide (PA)			
	Acid dyes	Pre-metallized dyes	Reactive dyes
Light fastness	+++	+++	+/-
Wash fastness	+/-	++	+++
Brilliance	+++	+/-	+++
Coverage of bairiness	+++	--	--
Ecological aspects	+++/-	--	+/-
Fixation time (Steam)	~3 - 5 min	~4 - 7 min	~5 - 10 min
Application	For residential carpet	Contract carpet, automotive carpet	Mats for laundry industry, bath-mats
Remarks	Good all over properties	For dull shades	For brilliant shades
Popular dyes			
Dystar	Telon, Telon A, Telon M	Isolan, Isolan S, Isolan 2S	Realan
Clariant	Lanasan, Nylosan	Lanasyn	Drimalan
Ciba	Tectilon, Erionyl	Lanaset, Irgalan	Eriofast



Wool (WO)			
	Acid dyes	Pre-metallized dyes	Reactive dyes
Light fastness	+	+++	+/-
Brilliance	++	--	++
Ecological aspects	+++	--	+/-
Steaming time	~6 - 8 min	~7 - 10 min	~8 - 12 min
Application	Residential carpets, rugs	Residential carpets, rugs	Yarn dyeing
Remarks	Light and medium shades	For dull shades	
Popular dyes			
Dystar	Telon, Telon M	Isolan, Isolan S, Isolan 2S, Supralan	Realan
Clariant	Lanasan, Sandolan	Lanasyn, Lanasan	Drimalan
Ciba	Tectilon, Erionyl	Lanaset, Irgalan	Eriofast

	Acrylic (PAN)	Polyester (PES)	Cotton (CO)	
	Cationic dyes (Basic dyes)	Disperse dyes	Reactive dyes	Direct dyes (Substantive dyes)
Light fastness	++	+++	+/-	+
Wash fastness	+++	++	+++	-
Brilliance	+++	+++	+++	++
Coverage of bairiness	+++	+++	+++	
Ecological aspects	++	+	-	+
Steaming time	~4-8 min	~8-15 min	~8-12 min	~5-8 min
Application	For bath mats, rugs and mink blankets	Residential carpet	For bath mats and rugs	
Remarks	Quality of heat-setting is important for rugs and mats.	Dyeing is done in pressure becks. For printing a carrier must be used.	Requires complicated after-treatment. Process not recommended for carpet printing!	Wash fast up to a temperature <40° C/105° F. For light and medium shades.
Popular dyes				
Dystar	Astrazon	Dianix	Remazol	Sirius
Clariant	Sandocryl	Foron	Drimaren	Indosol, Optisal
Ciba	Maxilon	Terasil	Cibacron	Solophenyl